

Fundamentals of metrology - opis przedmiotu

Informacje ogólne	
Nazwa przedmiotu	Fundamentals of metrology
Kod przedmiotu	06.2-WE-ELEKTP-FoM-Er
Wydział	Wydział Nauk Inżynieryjno-Technicznych
Kierunek	Elektrotechnika
Profil	ogólnoakademicki
Rodzaj studiów	Program Erasmus pierwszego stopnia
Semestr rozpoczęcia	semestr zimowy 2022/2023

Informacje o przedmiocie	
Semestr	3
Liczba punktów ECTS do zdobycia	6
Typ przedmiotu	obowiązkowy
Język nauczania	angielski
Sylabus opracował	<ul style="list-style-type: none">prof. dr hab. inż. Ryszard Rybski

Formy zajęć					
Forma zajęć	Liczba godzin w semestrze (stacjonarne)	Liczba godzin w tygodniu (stacjonarne)	Liczba godzin w semestrze (niestacjonarne)	Liczba godzin w tygodniu (niestacjonarne)	Forma zaliczenia
Wykład	30	2	-	-	Egzamin
Laboratorium	30	2	-	-	Zaliczenie na ocenę
Ćwiczenia	15	1	-	-	Zaliczenie na ocenę

Cel przedmiotu

- to familiarize students with the basic issues of measurements theory and the system of measurements and standards
- to familiarize students with methods and instruments for measuring selected electrical quantities and to make students aware of the limitations of their use
- shaping skills in measurement results development and evaluation of measurement errors and uncertainties
- acquainting with the metrological properties of measurment instruments
- shaping skills in design of measurement instruments components

Wymagania wstępne

Mathematical analysis I, Mathematical basics of technique, Fundamentals of electrical engineering

Zakres tematyczny

Basic terms in metrology. Measurement scales and units of measure. Selected quantities standards. Measurement methods and their accuracy. Method of direct and indirect comparison. Method of contraposition and replacement. Differential and zero metod. Compensation and tilting method.

Determining inaccuracy of measurement results. Systematic errors, random and excessive. Errors of a measurement method. Basic and additional errors of measurement instruments. Dynamic errors. Calculation of limit errors in direct and indirect measurements. Uncertainty of measurement. Uncertainty of type A, type B and type A and B. Standard and extended uncertainty. Determining uncertainty in direct and indirect measurement.

General information about mathematical modeling of phenomena and objects. Parametric and non-parametric identification. Static and dynamic models. Point and field models. Concepts of inadequacy and inaccuracy. Specifying model parameters by the least squares method. Tabular-graphical representation of a model.

Measurement signals. Classification and mathematical models of selected measurement signals. Characteristics of measurement instruments. Classification of measurement tools. Metrological structure of a measurement instrument. Basic metrological properties of measurement instruments.

Metody kształcenia

Lecture: conventional lecture

Laboratory: laboratory exercises

Exercises: computational exercises

Efekty uczenia się i metody weryfikacji osiągnięcia efektów uczenia się

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
He is able to design basic functional blocks of measurment instruments		<ul style="list-style-type: none">kolokwium	<ul style="list-style-type: none">Wykład

Opis efektu	Symbole efektów	Metody weryfikacji	Forma zajęć
He is able to list basic measurement methods and structures of measurement instruments and indicate their advantages and constrains		<ul style="list-style-type: none"> bieżąca kontrola na zajęciach kolokwium 	<ul style="list-style-type: none"> Wykład Laboratorium Ćwiczenia
He is aware of the role of measurement units standards and the international system of units (SI) in a measurement process		<ul style="list-style-type: none"> kolokwium 	<ul style="list-style-type: none"> Wykład
He know how to calculate errors and uncertainties of measurements		<ul style="list-style-type: none"> bieżąca kontrola na zajęciach kolokwium 	<ul style="list-style-type: none"> Wykład Laboratorium Ćwiczenia
Student is able to define basic metrology terms		<ul style="list-style-type: none"> kolokwium 	<ul style="list-style-type: none"> Wykład

Warunki zaliczenia

Lecture - a condition of passing is to obtain positive grades from written or oral tests conducted at least once in a semester.

Exercises - a condition of the pass is to obtain positive partial grades from examinations in the form proposed by the instructor.

Laboratory - a condition of the pass is to obtain positive grades from all laboratory exercises provided for under the laboratory program.

Components of the final grading = lecture: 34% + laboratory: 33% + exercises: 33%

Literatura podstawowa

1. Tumanski S.: Principles of electrical measurement. Taylor & Francis, 2006
2. Bhargawa S.C: *Electrical measuring instruments and measurements*. CRC Press, 2012

Literatura uzupełniająca

1. Skubis T.: *Fundamentals of measurement results metrological interpretation*. Published by Silesian University of Technology, Gliwice, 2004 (in Polish)
2. Guide to the Expression of Uncertainty in Measurement, BIPM, IEC, IFCC, ISO, IUPAC, IUPAP, OIML, 1995.

Uwagi

Zmodyfikowane przez dr hab. inż. Paweł Szcześniak, prof. UZ (ostatnia modyfikacja: 06-04-2022 22:42)

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